FIRST RECORD OF *JAMIDES ALEUAS PHOLES* FRUHSTORFER, 1915 (LEPIDOPTERA: LYCAENIDAE: POLYOMMATINAE) FROM NORTHERN CAPE YORK PENINSULA, AUSTRALIA, WITH NOTES ON ITS LIFE HISTORY AND BIOLOGY

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Abstract

Jamides aleuas pholes Fruhstorfer, 1915 is recorded from northern Cape York Peninsula, Australia for the first time. A previously overlooked record from Kiunga in Western Province, Papua New Guinea is also noted. Notes on its life history and biology are presented and compared with the Australian endemic subspecies *J. a. coelestis* (Miskin, 1891), previously recorded from Shipton's Flat near Cooktown south to Paluma in the Wet Tropics area of northern Queensland but with a new northerly record approximately 60 km north of Shipton's Flat. *Jamides aleuas pholes* and *J. a. coelestis* are allopatric in Australia, with populations geographically separated by some 550 km. The immature stages of *J. a. pholes*, like those of *J. a. coelestis*, have been discovered on *Arytera* sp. (Sapindaceae) growing within the rainforest understorey. Larvae of *J. a. pholes* were found to be associated with the ants *Rhytidoponera* Mayr sp. (Ectatomminae) and *Tetramorium pacificum* Mayr (Myrmicinae).

Introduction

Jamides aleuas (C. & R. Felder, 1865) occurs from Aru Island through mainland Papua New Guinea and northeastern Australia to the Bismarck Archipelago (Tite 1960, Parsons 1998, Braby 2000). Parsons (1998) recognised six of the nine subspecies originally identified by Tite (1960), elevating *J. allectus* (Grose-Smith, 1894) to species status based on morphological and genitalic differences and placing *J. allectus jobiensis* (Tite, 1960) and *J. allectus sarmice* (Fruhstorfer, 1915) as subspecies of it. Parsons (1998) only recorded the subspecies *J. aleuas nitidus* Tite, 1960 from Papua New Guinea, where he noted it to be widespread throughout the mainland. *Jamides aleuas coelestis* (Miskin, 1891) is endemic to Australia, being restricted to northeastern Queensland from Shipton's Flat near Cooktown to 30 km south-west of Ingham and Little Crystal Creek near Paluma (Braby 2000). A single male of *J. a. coelestis* was collected on 31 May 2006 at Leggett's Crossing on the Endeavour River, 26 km northwest of Cooktown, by Dr C. G. Miller and is recorded here as the new northern record for the subspecies, extending its northern limit approximately 60 km further north of Shipton's Flat. No other subspecies of *J. aleuas* has been recorded previously from Australia.

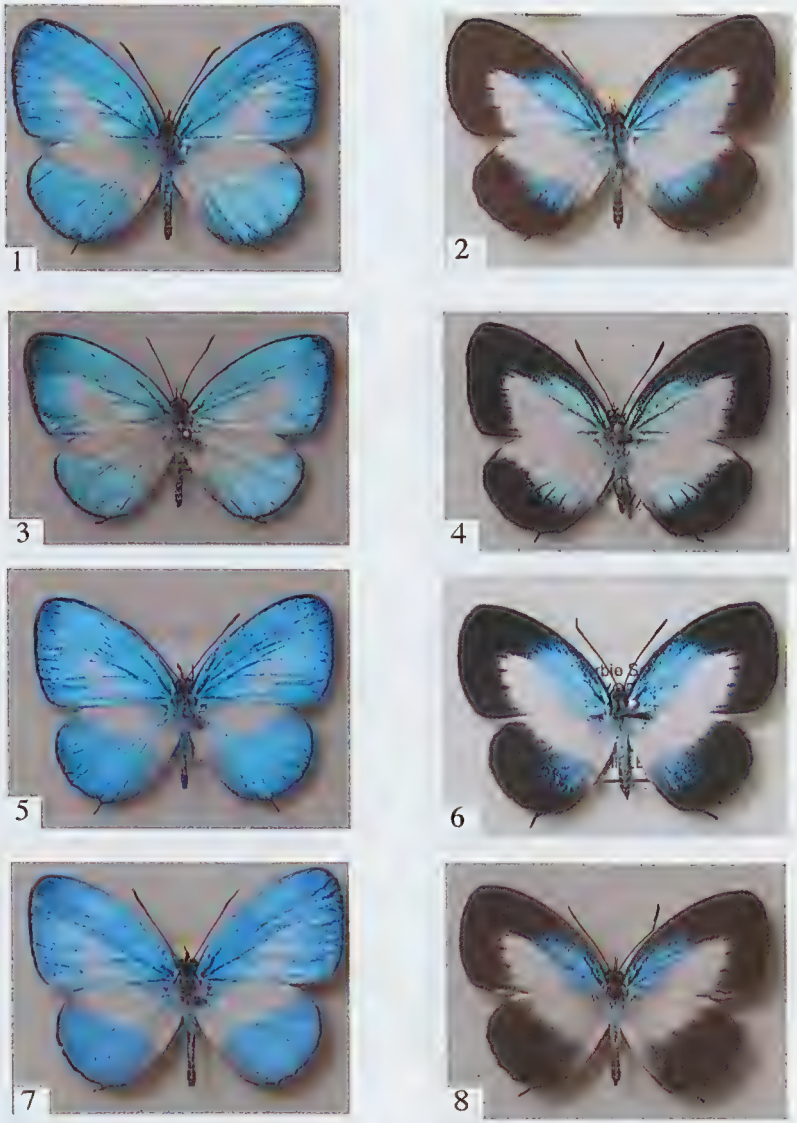
In late April 2003, two males and two females of a *Jamides* Hübner, 1819, whose identity was unknown to us at the time, were collected by one of us (SSB) in the Lockerbie Scrub area of Cape York Peninsula. Later, in June 2003, the early stages of the butterfly were discovered by another of us (PRS)

in the same locality and successfully reared to adults. Further adults were collected in September 2003 at Roma Flat, 8.9 km north of Lockerbie by Robert Ham. In April and May 2004, May 2005 and June 2006, three of us (SSB, RPW and CEM), together with Dr C. G. Miller, conducted extensive surveys of the rainforest regions of northern Cape York Peninsula from Lockerbie Scrub north to Pajinka and Somerset, determining that the species is well established and widespread throughout the northern tip area, although uncommon.

Comparison of our material from northern Cape York Peninsula with the type specimens of *J. a. nitidus* (Figs 29-32), specimens in the Brandt Collection in the Australian National Insect Collection, Canberra (ANIC) labelled as *J. a. nitidus* (Figs 1-2, 9-10) and those labelled as *J. a. pholes* Fruhstorfer, 1915 (Figs 7-8, 15-16) from Papua New Guinea, show a close similarity to those labelled as *J. a. pholes* in the Brandt Collection. The Brandt Collection contains specimens labelled as *J. a. pholes* from Kiunga on the Fly River and Rouku (north of Torres Strait), Papua New Guinea, although Parsons (1998) did not record *J. a. pholes* from Papua New Guinea.

The type specimen of *J. a. pholes* is apparently lost, although Tite (1960) applied the name to specimens from scattered localities in Dutch New Guinea (now West Papua, Indonesia). Tite (1960) noted that the male is deep blue above and that the white area on the forewing is variable in extent and in some examples reduced almost to vanishing point. Tite (1960) recorded *J. a. pholes* from Dorey Bay, Manokwari, Arfak, Weyland Mountains, Fak Fak, Utakwa River and Schouten Island, all of which occur in West Papua. The type specimen of *J. a. nitidus* (Figs 29-30) was assigned by Tite (1960) from the Upper Aroa River, British New Guinea (now southern Papua New Guinea) and is in The Natural History Museum, London (BMNH). Tite (1960) separated *J. a. nitidus* from other members of the *J. aleuas* group by the following distinguishing features: the broad black margins, 2-3 mm at the forewing apex; the white area on the forewing having markedly blue-scaled veins in the male; and the underside white cuneiform spots in both sexes being often tinted with whitish-blue.

Some confusion surrounds the descriptions by Tite (1960) and Fruhstorfer (1915) of *J. a. nitidus* and *J. a. pholes* with respect to the distribution of white on the underside crescent markings. Both authors stated that each subspecies may have white areas to a differing degree. Tite (1960) made the comment that 'another source of uncertainty is that Fruhstorfer's pl. I and II in *Arch. Naturgesch.* (**81**, A6) are incorrectly numbered; these double-page plates should be renumbered from left to right horizontally across the page, when the figures will be found to be consistent with the text.' The arrangement of species in the Brandt collection (ANIC) follows that of Tite. Brandt would have been aware of Tite's descriptions and Tite's basis for separating *J. a. nitidus* and *J. a. pholes*, as the arrangement of Brandt's collection was done



Figs 1-8. *Jamides aleuas* subspp., uppersides. (1) *J. a. nitidus* male, Rouku, PNG; (2) *J. a. nitidus* female, Rouku, PNG; (3) *J. a. coelestis* male, Mowbray River, Qld; (4) *J. a. coelestis* female, Mowbray River, Qld; (5) *J. a. pholes* male, Lockerbie, Qld; (6) *J. a. pholes* female, Lockerbie, Qld; (7) *J. a. pholes* male, Kiunga, PNG; (8) *J. a. pholes* female, Kiunga, PNG.

Figs 9-16. *Jamides aleuas* subspp., undersides. (9) *J. a. nitidus* male, Rouku, PNG; (10) *J. a. nitidus* female, Rouku, PNG; (11) *J. a. coelestis* male, Mowbray River, Qld; (12) *J. a. coelestis* female, Mowbray River, Qld; (13) *J. a. pholes* male, Lockerbie, Qld; (14) *J. a. pholes* female, Lockerbie, Qld; (15) *J. a. pholes* male, Kiunga, PNG; (16) *J. a. pholes* female, Kiunga, PNG.

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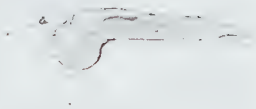

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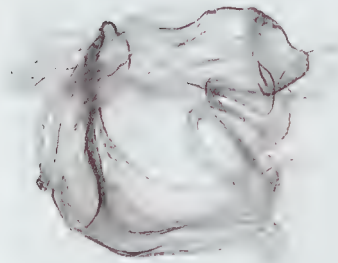

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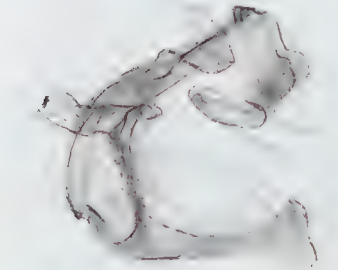

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Figs 17-22. *Jamides aleuas* subspp., male genitalia. (17-20) *J. a. pholes*: (17) valvae, Lockerbie, Qld; (18) aedeagus, Lockerbie, Qld; (19) valvae, Kiunga, PNG; (20) aedeagus, Kiunga, PNG. (21-22) *J. a. coelestis*: (21) valvae, Shipton's Flat, Qld; (22) aedeagus, Shipton's Flat, Qld.

after 1960, when Tite published his taxonomic revision. The BMNH collection was arranged according to Tite's description of the subspecies in the *J. aleuas* group (E. D. Edwards pers. comm.) and that arrangement is followed here.

Gotts and Pangemanan (2003 p. 247) illustrated *J. a. pholes* from Manokwari in West Papua (formerly Irian Jaya) which, when compared with Brandt's Papua New Guinea *J. a. pholes* labelled specimens and our material from northern Cape York Peninsula (Figs 5-6, 13-14), are morphologically identical. Males from northern Cape York Peninsula do not have the broad black forewing apical margins present in males of *J. a. nitidus* and, in both sexes, the marginal and sub-marginal spots on the hindwing underside are brilliant metallic blue, as opposed to specimens of *J. a. nitidus* which are white or whitish-blue and are easily distinguishable from specimens of *J. a. coelestis* (Figs 3-4, 11-12), which occur some 550 km further south of Lockerbie. The northern Cape York Peninsula specimens are therefore placed with *J. a. pholes*, extending the known range for this butterfly approximately 300 km further south from Rouku, Papua New Guinea to the Australian mainland. The presence of *J. a. pholes* in Papua New Guinea is also noted here on the basis of *J. a. pholes* labelled specimens contained in the Brandt Collection, ANIC, from Kiunga, North Fly Region, Western Province, Papua New Guinea.

Life history

Larval food plant. The larval food plant in Australia is *Arytera* sp. (Sapindaceae).

Hatched egg (Fig. 23). Diameter 0.9 mm. Flattened, strongly dished and concave above, outer rim with large pits, small pits across upper surface.

Final instar larva (Fig. 25). Length 12.5 mm (n = 14). Body deeply divided between segments; pale green, more whitish dorsally with green mid-dorsal line; erect pale brown secondary setae; spiracles white; head pale brown; prothoracic and anal plates green. Newcomer's organ and tentacular organs present. Mature larvae turn olive-green, changing to pinkish-purple immediately prior to pupation.

Pupa (Fig. 27). Length 11.2 mm, width 3.6 mm (n = 14). Pale brown speckled with dark brown; a dark brown mid-dorsal line; thorax with dark brown patches mid-dorsally on T1 and dorsolaterally on T2 and T3; abdomen with a dark brown dorsolateral patch on first segment and dark brown dorsolateral spots on posterior segments; attached by anal hooks and central girdle.

Biology

Adults of *J. a. pholes* were encountered sporadically throughout the rainforest regions of northern Cape York Peninsula. Males were found flying

Figs 23-28. Early stages of *Jamides aleuas* subspp. (23, 25, 27) *J. a. pholes*, Lockerbie, Qld; (24, 26, 28) *J. a. coelestis*, Mowbray River, Qld. (23, 24) egg; (25, 26) larva; (27, 28) pupa. Scale bars: figs 23-24 = 0.5 mm; figs 25-28 = 5 mm

in areas of dappled sunlight in the rainforest understorey. The brilliant blue dorsal surface of the wings made the males highly visible from approximately 30 m. Some males appeared to establish territories around small shrubs in and immediately adjacent to sun-lit areas. The majority, though, were observed to fly generally throughout the rainforest understorey with no preference for sunny areas. This behaviour is in stark contrast to that of *J. a. coelestis*, the adults of which tend to gravitate towards sunny patches in the rainforest or along rainforest verges and have a much slower flight. The flight of *J. a. pholes* was rapid and jerking, typical of the genus. One female was collected as it circled a shrub in a darker part of the rainforest but no oviposition behaviour was observed. Another female was collected as it rested on a twig, again in a darker area of the rainforest. *Hypochrysops theon medocus* (Fruhstorfer, 1908), *Danis danis syrius* Miskin, 1890, *Candalides helenita* (Semper, [1879]) and *Elymnias agondas* (Boisduval, 1832) were found flying in the same areas. Parsons (1998) noted a possible mimetic relationship between *J. aleuas* and *Danis danis* (Cramer, [1775]), with the latter, he believed, serving as a distasteful model.

An unhatched egg and six first to third instar larvae were first collected at Lockerbie on 16 June 2003 by PRS, on a small single-stemmed larval food plant (about 1 m high). The larvae were feeding openly on the large soft bluish-purple juvenile leaves while the egg was on an unexpanded terminal leaf. Only three juvenile leaves were present on this plant but these leaves were sufficient to rear three larvae to maturity. The larvae grew very rapidly, and all adults emerged by 4 July 2003.

In 2004, after extensive searching of the rainforest understorey on either side of the road over a distance of some 12 km from Lockerbie, north through Roma Flat to Pajinka and north-east to Somerset, 22 larvae of varying instars were collected feeding on the juvenile leaves of the larval food plant. The bluish-purple juvenile growth of the larval food plant is easily identifiable in the rainforest understorey, with the leaves variable in size with some observed up to 250 mm in length and dangling conspicuously towards the ground. The larvae were often found inside crude shelters made by lightly silking the outer edges of the leaves together. On several occasions, larvae were found inside these crude shelters on plants which also had nests of the green tree ant *Oecophylla smaragdina* Fabricius, 1775 (Formicinae). When the shelters were opened the larvae were immediately attacked and killed by the green tree ants. The larvae fed from the tip of the leaves up towards the petiole. In 2004, larvae were found to be associated with the ants *Rhytidoponera* Mayr sp. (Ectatomminae) and *Tetramorium pacificum* Mayr, 1870 (Myrmicinae). Larval colouration was distinctly cream on the juvenile leaves, turning olive-green and then pinkish-purple the day prior to pupation. After hatching, the larval duration was six to seven days and the pupal duration six to eight days.

The egg, larva and pupa are very similar in form to those of *J. a. coelestis*. Larvae of *J. a. coelestis* collected at Mowbray River, near Mossman in 2005, were attended by a different small black ant but were indistinguishable from *J. a. pholes* larvae. During the pre-pupal stage the larval colouration closely matched the colour of the immature leaves of the respective larval food plants, being bluish-purple for *J. a. pholes* and pinkish-red for *J. a. coelestis*.

Figs 29-32. *Jamides aleuas nitidus*. (29-30) holotype male upper and undersides; (31-32) 'allotype' female upper and undersides. Label data: Upp[er] Aroa R., Brit. N.G., March [19]03, [A.S.] Meek. Copyright BMNH, London.

Discussion

The *Jamides aleuas pholes* specimens (Figs 5-6, 13-14) from northern Cape York Peninsula can be distinguished from *J. a. coelestis* (Figs 3-4, 11-12) by the distinctly rounded forewing termen in both sexes, narrower black marginal band on the male forewing, deeper blue on both sexes, more restricted (or sometimes absent) white areas in the male forewing and the shape and colour of the marginal and sub-marginal spots on the hindwing underside. In *J. aleuas coelestis* these spots are extensively white to whitish-blue, whereas in *J. a. pholes* they are brilliant metallic blue and much larger. In *J. aleuas nitidus* (Figs 1-2, 9-10 and 29-32) these spots are generally similar in colour to those of *J. a. pholes* but smaller, although some

specimens of *J. a. nitidus* have white dominant. The shape of the forewing in both sexes of *J. a. coelestis* and the pale shining blue in the males clearly separate it from *J. a. pholes* and *J. a. nitidus* and *J. a. pholes* has a white central area on the antennal shaft which is absent in *J. a. coelestis*. Both *J. a. pholes* and *J. a. nitidus* show a close similarity to the type specimen of *J. a. aleuas*, with specimens of *J. a. coelestis* having evolved to a more distant relationship to the type subspecies with regard to the features described above.

The series of specimens of *J. a. pholes* (Figs 7-8, 15-16) in the Brandt Collection, ANIC shows a consistent lack of any white in the hindwing underside crescent areas, whereas those of *J. a. nitidus* have a predominance of white in the sub-marginal row. The undersides of the specimens of *J. a. nitidus* illustrated in Parsons (1998 pl. 70, 2045-2049) are very similar to the Brandt *J. a. pholes* specimens and differ from the majority of Brandt's *J. a. nitidus* specimens. The forewing upperside of the males of *J. a. nitidus* in the Brandt Collection differs from those males of *J. a. pholes* from Papua New Guinea, West Papua and the northern Cape York Peninsula area by the broader black margins and wide white areas and is consistent with the *J. a. nitidus* description provided by Tite (1960).

Tite (1960) claimed that specimens of *J. a. pholes* were lodged in the Macleay Museum at Sydney University. This collection has been examined and contains no specimens of *J. a. pholes*. There are, however, specimens of *J. nemophilus* (Butler, 1876) from Darnley Island, Torres Strait, *J. a. coelestis* and *Psychonotus caelius* (C. Felder, 1860), so some confusion may have arisen with misidentification. A female of *J. nemophilus* was found in the collection to be incorrectly labelled as *J. a. coelestis*. A single male in the Australian Museum, Sydney from Lake Murray (19/11/1922) in central-western Papua was examined and appeared to be *J. a. pholes* but was too worn to be confirmed. The genitalia of that specimen were not examined.

Genitalia examinations of the northern Cape York Peninsula (Figs 17-18) and Papua New Guinea (Figs 19-20) specimens of *J. a. pholes* and of *J. a. coelestis* (Figs 21-22) showed very little difference. The general shape of the valva was similar in all three, although the uncus was slightly more produced in Papua New Guinea specimens of *J. a. pholes*. The aedeagus was similar in all three. While illustrating a relationship between the northern Cape York Peninsula and Papua New Guinea specimens of *J. a. pholes*, the genitalia by themselves cannot be used to separate specimens of *J. a coelestis* from *J. a. pholes*.

Jamides aleuas pholes and *J. a. coelestis* are allopatric in Australia with populations being geographically separated by some 550 km. Further work needs to be carried out on the taxonomic position of *J. a. coelestis*, given the marked adult morphological differences between it and other subspecies of the *Jamides aleuas* group.

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